Patent Claims

1. Process for the preparation of mono(fluoroalkyl)- or bis(fluoroalkyl)phosphoric acid, mono(fluoroalkyl) or bis(fluoroalkyl) phosphates and the corresponding phosphoranes thereof, comprising at least the reaction of a bis(fluoroalkyl)phosphinic acid or a (fluoroalkyl)phosphonic acid or a corresponding derivative or salt of these acids with anhydrous hydrogen fluoride.

2. Process according to Claim 1,
characterised in that use is made of a bis(fluoroalkyl)phosphinic acid or a corresponding derivative in which the two fluoroalkyl groups are identical or different.

3. Process according to Claim 1 or 2,
characterised in that use is made of a bis(perfluoroalkyl)phosphinic acid or a (perfluoroalkyl)phosphonic acid or a corresponding derivative of these acids in which the perfluoroalkyl groups contain 1 to 20 C atoms and are straight-chain or branched.

4. Process according to one or more of Claims 1 to 3,
characterised in that the derivative of bis(fluoroalkyl)phosphinic acid or (fluoroalkyl)phosphonic acid employed is the salt with a mono-, di- or trivalent metal cation.

5. Process according to Claim 4,
characterised in that the mono-, di- or trivalent metal cation is selected from the group Li^+, Na^+, K^+, Mg^{2+}, Ca^{2+}, Ba^{2+}, Zn^{2+}, Cu^{2+} or Al^{3+}.

6. Process according to one or more of Claims 1 to 3, characterised in that the derivative of bis(fluoroalkyl)phosphinic acid or (fluoroalkyl)phosphonic acid employed is the salt with a mono- or divalent organic cation.

7. Process according to Claim 6, characterised in that the mono- or divalent organic cation is selected from the group tetraalkylammonium, tetraalkylphosphonium, triarylalkylphosphonium, guanidinium, pyrrolidinium, pyridinium, imidazolium, piperazinium or hexamethylenediammonium.

8. Process according to one of Claims 1 to 3, characterised in that the derivative of bis(fluoroalkyl)phosphinic acid or (fluoroalkyl)phosphonic acid employed is an ester of bis(fluoroalkyl)phosphinic acid or (fluoroalkyl)phosphonic acid.

9. Process according to one or more of Claims 1 to 3, characterised in that the derivative of bis(fluoroalkyl)phosphinic acid or (fluoroalkyl)phosphonic acid employed is the salt with a polycation.

10. Process according to Claim 9, characterised in that the polycation is selected from the group of polyammonium cations.

11. Process according to one or more of Claims 1 to 10, characterised in that the reaction is carried out in a polar solvent or without a solvent.

12. Process according to one or more of Claims 1 to 11, characterised in that the reaction is carried out at a temperature of -20°C to 100°C.

13. Process according to one or more of Claims 1 to 12, characterised in that the reaction is carried out with 4- to 100-fold the molar amount of hydrogen fluoride.

14. Process for the preparation of phosphoranes according to one or more of Claims 1 to 13, characterised in that the mono- or bis(fluoroalkyl) phosphate formed after the reaction with hydrogen fluoride is reacted with a strong electrophilic reagent or a strong Lewis acid.

15. Process according to Claim 14, characterised in that the reaction is carried out with an electrophilic reagent or a Lewis acid selected from the group $(CH_3)_3SiCl$, SO_2Cl_2, SbF_5, $AlCl_3$, VF_5, $SbCl_5$, NbF_5, AsF_5, BiF_5, AlF_3 and TaF_5.